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June 18, 2001

Ms. Cheri Davis
California Energy Commission
Energy Facilities Siting and Environmental Protection Division
1516 Ninth Street, MS-15
Sacramento, CA 95814

Subject: East Altamont Energy Center Application for Certification (01-AFC-04)
Revised Slope Stability Analysis for the Report of Waste Discharge Permit

Dear Ms. Davis:

Enclosed are 125 copies of the revised slope stability analysis requested by the Central Valley Regional Water Quality Control Board for the East Altamont Energy Center Report of Waste Discharge (ROWD) permit application. The attached letter was submitted to the Central Valley Regional Water Quality Control Board on June 18, 2001.

If you have any questions, please call me at 916-920-0300.

Sincerely,

CH2M HILL

Jerry Salamy
Project Manager

c: Alicia Torre/Calpine
Steve DeYoung/Calpine
Jim McLucas/Calpine
EJ Koford/CH2M HILL
Nancy Werdel/WAPA

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June 19, 2001

Mr. Ross D. Atkinson
Associate Engineering Geologist
California Regional Water Quality Control Board – Central Valley Region
3443 Routier Road, Suite A
Sacramento, CA 95827-3003

Subject: East Altamont Energy Center

Dear Mr. Atkinson:

Per your request made during our 6/18/2001 telephone conversation, enclosed please find an amended slope stability analysis for the Report of Waste Discharge (ROWD) for the subject project. This amended analysis was also transmitted to you via facsimile at 9:00 AM this morning. Please note that the factor of safety for dynamic (seismic) conditions has been increased to 1.59, which is greater than the 1.50 factor required by Title 27.

Thank you for your consideration and quick response in producing a letter from your agency deeming the ROWD "complete and adequate." As mentioned to you today over the phone, the Calif. Energy Commission requires your letter by tomorrow afternoon in order for it to be considered at the upcoming June 27 Board of Commissioners meeting.

Sincerely,

CH2M HILL

David R. Jones

David R. Jones
Task Manager

Cc/enc: Steve DeYoung, Calpine Corporation
Jim McLucas, Calpine Corporation
Jerry Salamy, CH2M HILL
Lorraine White, California Energy Commission
Alicia Torre, Calpine Corporation

File No. 20-4561-01.G01
June 6, 2001

RECEIVED
JUN 19 2001

Ms. Toni Pezzetti
CH2M Hill
2485 Natomas Park Drive, Suite 600
Sacramento, CA 95833

Subject: **SUMMARY OF SLOPE STABILITY ANALYSES**
EVAPORATION AND WASTEWATER RECYCLE PONDS
EAST ALTAMONT ENERGY CENTER - ALAMEDA COUNTY, CA

Dear Ms. Pezzetti:

Presented in this letter is a summary of slope stability analyses performed for the evaporation and wastewater recycle ponds at the East Altamont Energy Center project located in Alameda County, California. As you are aware, our firm completed forty-six borings and CPT soundings and eleven backhoe test pits within the project site. The borings located within the evaporation and wastewater recycle ponds were previously submitted. Our field explorations suggest a relatively uniform soil profile in the upper approximate 15 feet which would be affected by the pond construction. Atterberg limits tests performed at depths of 1, 5, and 10 feet indicated plasticity indices of 20, 28, and 20, respectively. For simplicity, we have used a single soil profile of silty clay/clayey silt. We have attached the results of several CPT soundings from near the pond locations (B-34, B-35, B-38, and B-40) which indicate undrained shear strength in excess of 1,000 pounds per square foot (psf). We have also included results of unconfined compressive strength tests on samples from the 3 to 15 foot depths which also indicated shear strengths in excess of 1,000 psf.

The static and pseudo-static slope stability of the embankment was analyzed using simplified circular arc limit equilibrium procedures and the computer program SlopeW by GEO-SLOPE International. This program can model circular arch failures surfaces in accordance with Spencer, Bishop's, and Morganstern-Price methods and COE criteria. The stability evaluation methods first assume a trial circular failure surface through the embankment. The soil mass located above the failure surface is then divided into a series of vertical slices for ease of analysis, and resisting and driving forces acting on each slice are determined. These forces include the soil weight, the pore pressure, the effective normal force on the base, the mobilized shear force (including both cohesion and friction), and the horizontal side forces due to earth pressures. The stability of the embankment along the trial failure surface is estimated based on the factor of safety or ratio of moment resisting forces (soil strength, etc.) to moment driving forces (soil weight, pore pressures, etc.). The analysis is continued by assuming various trial failure surfaces until a minimum factor of safety or critical failure surface is determined.

For our evaluation of end of construction conditions, we assume the ponds would be empty. Since the ponds will be occasionally emptied for maintenance, the most severe, long-term loading

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condition would also be with no water. In other words, the placement of water in the ponds for long-term analyses would only increase the computed factors of safety since the weight of water would resist overturning forces. Any additional support provided by the 6- to 8-inch thick concrete mat on the bottom and side slopes has been neglected. We have assumed that material excavated from the pond area would be used to raise the grade around the evaporation and wastewater recycle ponds. For the purpose of our analyses, we have assumed that the ground surface would be raised approximately 5 feet surrounding the ponds which would place groundwater more than 5 feet below the bottom of the ponds. In our opinion, groundwater at this depth would have insignificant impact on our stability analyses. As mentioned above, the soil parameters used in our analyses were based on our evaluation of the material type and density, laboratory index properties, and results of laboratory strength tests. The consistency or relative densities of the soils were also based on field penetration tests. An average moist unit weight of 125 pounds per cubic foot (pcf) was used for the native clay soil. An undrained shear strength of 1,000 psf was used for the end of construction conditions. For long-term stability, an angle of internal friction of 20° was added to our soil profile and the undrained strength reduced to a very conservative value of 250 psf.

The results of earthquake analyses are critically dependent on the value of the horizontal seismic coefficients. The vertical seismic coefficient typically has little influence on the determined embankment factor of safety and was thus neglected. In recognition that the embankment is not rigid and that the peak acceleration exists for only a short time, Marcuson (1981) suggested that appropriate horizontal seismic coefficients for levees and dams should correspond to one-third to one-half of the maximum acceleration, including amplification or deamplification effects to which the embankment is subjected. Similarly, Hynes and Franklin (1984) applied the Newmark sliding block analysis to over 360 accelerograms and concluded that earth dams with pseudo-static factors of safety greater than 1.0 using a horizontal seismic coefficient of one-half the maximum acceleration and a 20 percent reduction in shear strength would not develop "dangerously large" deformations. Accordingly, for the purpose of our analysis, a horizontal seismic coefficient of 0.225, corresponding to one-half the peak ground acceleration determined by the Calfed Bay-Delta Program report (1998), was selected. The shear strength data was not reduced by 20 percent since the values selected already are considered very conservative.

The graphical results of our stability analysis for each condition are on the attached plates. The computer printouts of our stability analyses can be provided if needed. A review of our analyses shows that the proposed embankment should be very stable under all conditions with factors of safety exceeding 1.59 for seismic conditions and 2.8 for static conditions.

We trust this summarizes our recent discussions and presents the information requested. If you have any questions or need additional information, please contact us.

Respectfully submitted,

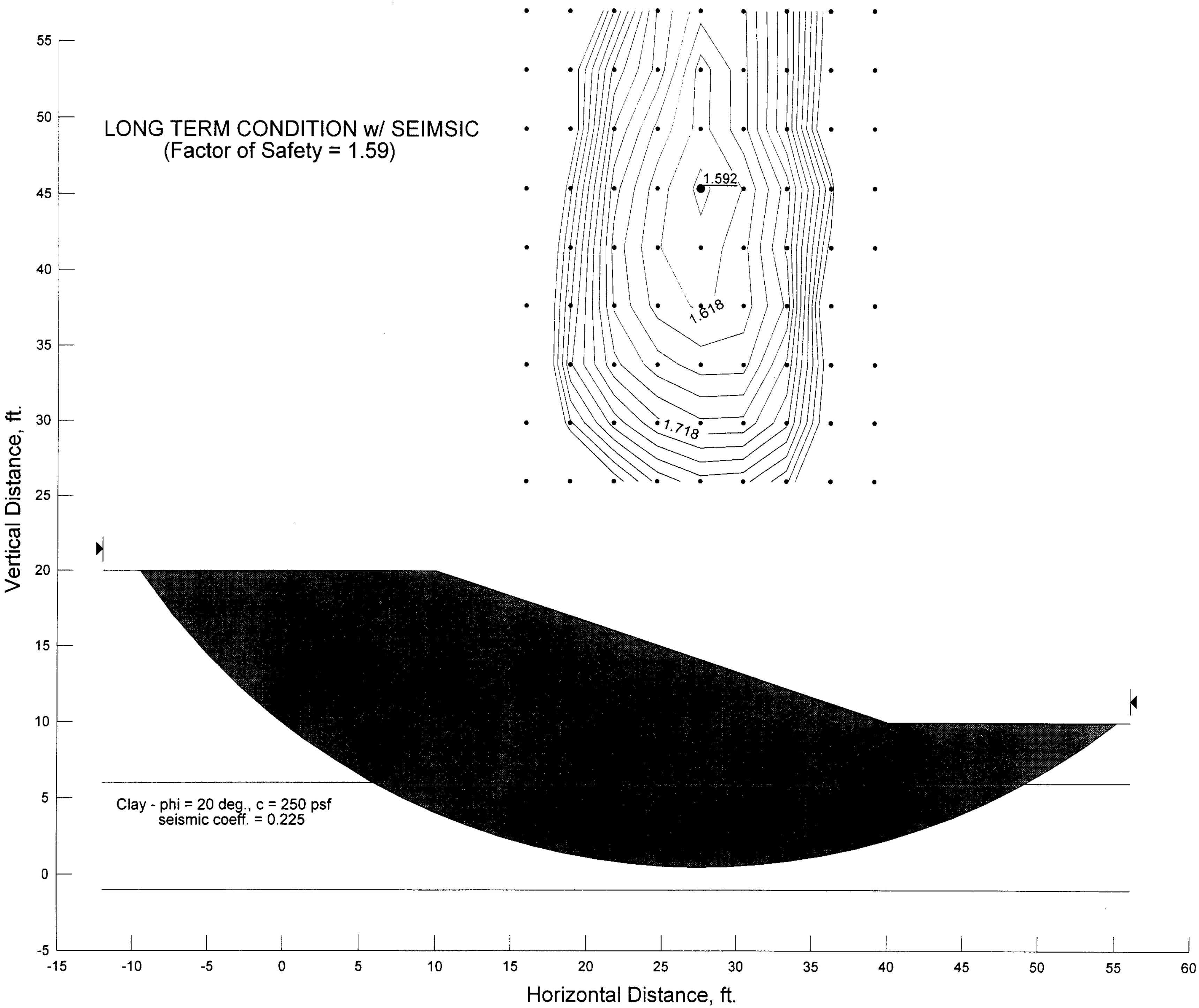
KLEINFELDER, INC.

Ron Heinzen

Ron Heinzen, G.E.
Regional Manager/Senior Principal

REGISTERED PROFESSIONAL ENGINEER
RONALD TERRY HEINZEN
No. 388
Exp. 3-31-03
GEOTECHNICAL
STATE OF CALIFORNIA

RTH:lr Attachment



LONG TERM CONDITION w/ SEIMSIC
(Factor of Safety = 1.59)
1.592
1.618
1.718
Clay - phi = 20 deg., c = 250 psf
seismic coeff. = 0.225
Vertical Distance, ft.
Horizontal Distance, ft.
55
50
45
40
35
30
25
20
15
10
5
0
-5
-15
-10
-5
0
5
10
15
20
25
30
35
40
45
50
55
60